Monitoring Study Group Meeting Minutes

September 19, 2012
Central Valley Regional Water Quality Control Board Office
Redding, California

The following people attended the MSG meeting: George Gentry (BOF—MSG chair), Drew Coe (CVRWQCB), Dennis Hall (CAL FIRE), Clay Brandow, (CAL FIRE), Mathew Boone (CVRWQCB), Shane Cunningham (CAL FIRE), Debra Hallis (CVRWQCB), Marily Woodhouse (Battle Creek Alliance), Patricia Lawrence (public), Justin Augustine (CBD), Stacy Stanish (DFG), Don Lindsay (CGS), Bill Short (CGS), Richard Gienger (public), Dr. Cajun James (SPI), Trey Sherrell (CVRWQCB), David Fowler (NCRWQCB), Nick Kunz (SWRCB), Linda Pankonin (Sierra Club), Dianna Thrasher (Sierra Club), Dr. Gordon Grant (USFS PNW), David Lodge (public), David Manthorne (HRC), Rob DiPerna (EPIC), Angela Wilson (CVRWQCB), Brad Valentine (DFG), Scott Carnegie (WM Beaty and Associates), Jim Harrington (DFG), and Pete Cafferata (CAL FIRE).

Participants on the GoToMeeting webinar/conference call included: Dr. Carolyn Hunsaker (USFS PSW), Dr. Lee MacDonald (CSU), Jim Ostroski (BOF), Kirsten Sequoia (Gualala River Watershed Council), Rich Wade (BOF), Ed Shruffenegger (CFA), and Martice Vasquez (CVRWQCB).
[Action items are shown in bold print].

The meeting began with general monitoring-related announcements:

- The Rural Roads Webinar Series [Series 1: Rural Roads and the Environment (7 presentations), Series 2: Rural Road Design and Operations (6 presentations), and Series 3: Rural Road Assessment, Remediation and Restoration (6 presentations)] are available at: http://www.ucanr.org/sites/forestry/Webinars/Rural_Roads_Webinar_Series/. Also, road field trips will be held on October 15th (Plumas Co.), October 22nd (San Luis Obispo Co.), and October 29th (Mendocino Co). Register for these trips online. Road publications are posted at: http://ucanr.org/sites/forestry/Webinars/Rural_Roads_Webinar_Series/Rural_Roads_Webinar_Resources/.

- The Sierra Nevada Adaptive Management Project (SNAMP) annual meeting will be held on October 23rd at the Wildland Fire Training Center--Guide Room, 3237 Peacekeeper Way, Sacramento, CA. Contact Kim Ingram (kcingram@ucanr.edu) for additional information.

- The 19th Annual California Aquatic Bioassessment Workgroup meeting will be held at UC Davis on November 7th and 8th. Contact: Jim Harrington, DFG, for more information, at: jharring@OSPR.DFG.CA.GOV.

- A special poster session on state BMPs for forestry-related water quality will be held in Spokane for the October Society of American Foresters National Convention, with 29 states participating. Pete Cafferata and Clay Brandow have prepared a poster titled *California's Approaches to Protect Water Quality on Non-Federal Timberlands*. The poster includes data on BMP/FPR compliance, BMP effectiveness based on monitoring and experimental watershed results, and how monitoring data has been used in California.

- The 50 year celebration workshop and field tour for the Caspar Creek watershed study that was scheduled to be held in September has been postponed due to unanticipated workload for the USFS PSW staff in Arcata. It is anticipated that these events will be held in June or July 2013. Information regarding the Caspar Creek project and the workshop is posted at: http://www.fs.fed.us/psw/topics/water/caspar/.

- The Timber Harvest Workgroup, chaired by Mario De Bernardo, Assembly Committee on Natural Resources, will have a Cumulative Effects Subgroup meeting on October 8th in Sacramento focusing on monitoring, including a presentation summarizing MSG activities from 1989 to the present.

- The American Geophysical Union (AGU) will hold its Fall Meeting from December 3rd-7th in San Francisco. On December 7th, there will be an applied session titled "Human Influences on Hydroecogeomorphic Processes Across Spatial Scales in Forested Landscapes." Drew Coe, representing the Battle Creek Task Force, will give a presentation titled "*Rapid Assessment of Logging-Associated Sediment-Delivery Pathways in an Intensively-Managed Forested Watershed in the Southern Cascades, Northern California*." Dr. Lee MacDonald will present a paper co-authored with Dr. Cajun James titled "*Effects of Forest Management and Roads on Runoff, Erosion, and Water Quality: The Judd Creek Experiment*." Abstracts for these papers are available online at: http://fallmeeting.agu.org/2012/scientific-program/.

- Dr. Cajun James announced that she has worked with Dr. Lee MacDonald, CSU, and Dr. Pete Robichaud, USFS RMRS, to install a research project in the Ponderosa Fire area (Battle Creek watershed) to measure surface erosion from burned areas; burned and salvage logged areas; and burned, logged, and ripped areas). Sediment fences have been installed in 10 swales. Dr. James also announced that SPI timberlands within burned areas are closed to the public.

- The California Licensed Foresters Association (CLFA) will hold their fall meeting on October 19th in Anderson, titled "Whiskey is for Drinking, Water is for Fighting." For more information, see: http://www.clfa.org/workshopscontinuing-education/.

- The 31st annual Salmonid Restoration Conference will be held from March 13th-16th, 2013, in Fortuna. For more information, see: http://calsalmon.org/salmonid-restoration-conference/31st-annual-salmonid-restoration-conference.

Biological Monitoring and Assessment Overview

Mr. Jim Harrington, DFG Projects Leader/Water Quality Biologist, provided a PowerPoint presentation titled "2012 Biological Assessment Overview." Mr. Harrington's PowerPoint is posted on the Monitoring Study Group's Archives website at: http://www.bof.fire.ca.gov/board_committees/monitoring_study_group/msg_archived_documents/.

The presentation began with historical background information on biological monitoring. Statutory authority comes from federal Clean Water Act Sec. 101. (a), which states "The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The US EPA defines biological integrity as "the capability of the waterbody to support and maintain a balanced, integrated, adaptive community of organisms having a composition and diversity comparable to that of natural habitats of the region." The US EPA has been actively pushing the states to include bioassessment into state water quality monitoring programs (e.g., for use in listing of impaired waters under Sec. 303(d) of the Clean Water Act). California is developing quantitative bio-criteria, similar to the majority of U.S. states; currently only 12 states have bioassessment programs in place. The goal is to have a bioassessment program in use in California by 2014.

The US EPA recommends using multiple assemblages for biological monitoring (i.e., fish, invertebrates, and algae). Benthic macroinvertebrates (BMI) are of particular value, since they are ubiquitous, relatively stationary, and their large species diversity provides a spectrum of responses to environmental stresses. Stream macroinvetebrates must be collected with standard protocols and a subsample is analyzed in the laboratory, where they are identified to a standard level (following standard protocols). Sensitive organisms include mayflies, stoneflies, caddisflies (collectively called EPT [Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichopera (caddisfly)] taxa), as well as

dragonflies and damselflies. Tolerate organisms include scuds, snails, leeches, and midges. Tolerate BMI increase in abundance and proportion with environmental stressors, while sensitive BMI are expected to decrease. Several different types of BMI metrics exist, including richness measures (e.g., EPT taxa), composition measures (e.g., % EPT individuals), tolerance/intolerance measures (e.g., % sensitive EPT taxa), and functional feeding groups (e.g., % shredder taxa). In total, there are 134 BMI metrics and standard protocols must be followed to produce the metrics. Bioassessment sampling protocol for California was standardized in 1994 with minimal revisions until 2007. From 2000-2007, western states pilot EMAP (Environmental Monitoring and Assessment Program) and CMAP (California's Monitoring and Assessment Program) sampling took place, using randomly selected sites. The biological condition of the western states streams were rated as: 45.1% good, 25.9% fair, 27.4% poor, and 1.7% not assessed. In 2007, following a comparability study conducted during EMAP, the California standardized sampling protocol was changed to be similar to the EPA national protocol. The comparability study allowed all pre-2007 bioassessment data to be converted to the new format.

Currently the 2007 Surface Water Ambient Monitoring Program (SWAMP) bioassessment protocol is used (see: http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures#Bioassessment). There are approximately 1600 "targeted" (non-random) SWAMP bioassessment monitoring sites in California, with citizen groups conducting some of the monitoring work. The complete procedure calls for collecting BMIs, measuring the physical habitat, and measuring basic water chemistry parameters. Physical parameters include channel slope, channel dimensions, discharge, and substrate composition. Also measured are percent algal cover, human influence on left/right banks and in the channel, riparian vegetation, canopy cover, habitat complexity, and bank stability. Reference sites are selected and sampled following a SWAMP standardized process in place since 2009, which is now in its implementation phase. There are a total of 615 reference sites in California wadeable streams, with 79 in the North Coast region, 131 in the western Sierra, 142 in the central Lahontan, 87 in the coastal chaparral, 96 in the south coast mountains, and 80 in other regions. The number of reference sites should expand over the years with further implementation of the Reference Streams Program.

Indices of biological integrity (IBI) have been established for different regions of California, allowing an observer to determine how well a given site compares to reference streams in a given region. As an example, Mr. Harrington displayed the large data set that currently exists for southern California. A southern California IBI scoring table was developed by Ode et al. (2005), with five categories established ranging from very poor to excellent (max 70 points; 70 x 1.43 = 100 points) (see: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/coastalstreams.pdf). In addition to the southern coastal region, IBIs have been completed for the north coastal region, eastern Sierra, and Central Valley.

Mr. Harrington also presented information on a second site scoring system commonly in use. The River Invertebrate Predictive and Classification System (RIVPACS) system developed by Dr. Chuck Hawkins, Utah State Univ., is used in the U.S., as well as in England and Australia. An "observed (O) to expected (E)" index is produced based on parameters such as area, elevation, season, etc. The O/E ratio provides a measure of the taxonomic completeness of the biological community observed at a site, with values ranging from 0 to 1.0. Excellent biological conditions are characterized by an O/E>0.8 (with a corresponding IBI =100-80), good to fair O/E =0.6 (IBI=79-40), poor O/E=0.3 (IBI = 39-20), and very poor O/E<0.2 (IBI <20).

The SWAMP Perennial Streams Assessment (PSA) for California's wadeable streams conducted from 2000 to 2007 using 200 sites found that the 8-year average had 49% of the sites consistent with reference standards (i.e., good biological condition), 27% altered, and 24% very altered. The North Coast and Sierra regions had relatively high ratings, as opposed to the Central Valley, Desert/Modoc, and South Coast regions. Forest land cover had mostly good biotic conditions (~70% of streams draining forested landscapes had good biological condition), while degraded sites were concentrated in urban (San Francisco Bay Area, southern coastal California) and agricultural areas (Imperial Valley,

Central Valley, Klamath River) (see: Ode et al. 2011 at: http://www.swrcb.ca.gov/water_issues/programs/swamp/docs/reports/psa_smmry_rpt.pdf).

Benthic invertebrates were found to have strong associations with several stressors that are high priorities for California's water quality programs (i.e., nutrients, fine sediments, and chloride). Instream habitat conditions (e.g., fine sediments, embeddedness, habitat complexity) were documented as consistently one of the strongest drivers of the biological condition of California's streams, and had a much stronger influence on biological condition than riparian condition. Instream habitat degradation and nutrient stressors were common in agricultural and urban streams, but were also present at a large percentage of forested streams statewide. These stressors were strongly associated with decreased biological integrity (see Ode et al. 2011 for more information).

Mr. Harrington stated that regulatory biological objectives can be achieved in California through the use of SWAMP bioassessment indicators, narrative objective standards, and existing regulatory programs (e.g., 401 water quality certification, 303(d) TMDL, NPDES/stormwater, BMP effectiveness, NPS monitoring, etc.). Two day bioassessment competency training courses are available from DFG, as well as 8 day SWAMP bioassessement field training classes. Data collected in the field under a DFG sampling permit and using standard protocols can be uploaded to the California Environmental Data Exchange Network (CEDEN) (http://www.ceden.org/).

During the question and answer period, Ed Shruffenegger asked Mr. Harrington if it was appropriate to have a "hard line" in a regulatory program using the RIVPACS O/E model (having regulatory implications). Mr. Harrington stated that he is confident that bioassessment is capable of determining whether a site is "good" or "bad", even with high natural variability, but that it is not appropriate to have one number for all sites that results in a site "passing" or "failing." **The MSG plans to continue this discussion of bioassessment and how it relates to timber harvest regulation with Ms. Karen Larsen, SWRCB Deputy Director, Office of Information Management and Analysis (OIMA), at our next meeting.**

The Hydrology and Geomorphology of the Oregon Cascades, with Implications for California's Young Volcanic Terrain

Dr. Gordon Grant, Research Hydrologist, U.S. Forest Service Pacific Northwest Research Station, provided a PowerPoint presentation titled "The Ultimate Hydrologic Sponge: How the Plumbing System of the Cascades Controls Streamflow, Geomorphology, and Response to Disturbance." Dr. Grant's PowerPoint is posted on the MSG's Archives website at: http://www.bof.fire.ca.gov/board_committees/monitoring_study_group/msg_archived_documents/. Dr. Grant's publications are posted at: http://www.fsl.orst.edu/wpg/people/gordon.htm.

Dr. Grant began his presentation on the hydrology of the Cascade Range with background information on the geology of the area, since the geologic composition controls the response of streams to winter storm events. While the Cascades extend from Mount Lassen north into British Columbia, the Oregon Cascades were the focus of the main portion of Dr. Grant's talk. He presented a diagram illustrating how plate tectonics have formed the Cascade Range, with the Cascadia subduction zone off the Oregon Coast producing active volcanoes in the high Cascades. The volcanic rocks go from older to younger as one moves from west to east across the Cascade Range, with the Deschutes River basin nearly entirely composed of young volcanic rocks on the east side of the crest. Due to FERC relicensing issues, Dr. Grant studied the hydrology of the Deschutes basin, where a substantial river canyon has been carved in the volcanic landscape. Unexpectedly, he found the flow regime to be uncommonly stable with very little sediment transport. The large dams on the river were not found to have altered the flow or sediment regimes substantially. Additionally, the 1996 flood of record did not alter the channel as would be expected. In essence, the Deschutes River behaves similar to a large spring-fed creek and was described as a "peculiar river" in an AGU book by that name edited by Dr. Jim O'Connor and Dr. Grant.

Dr. Grant then asked the question: “Are there other peculiar places, drained by uplifted, young volcanic rocks, in the path of westerly prevailing winds, at a temperate latitude, and near a source of marine moisture?” Westside Cascade Willamette River tributaries, including the McKenzie, Santiam, and Clackamas, were all considered candidates. Plots of annual flows from these rivers revealed two distinct flow regime types: (1) western Cascade streams (e.g., Little North Santiam River), with very high winter peak flows and low summer base flows, and (2) high Cascade streams (e.g., Clackamas River), with moderate mid-winter peak flows and high sustained summer base flows. This was explained by the western Cascades having older (7-30 million year old) volcaniclastic rocks and basaltic lava flows with steep, dissected terrain and high drainage densities, generating a flashy hydrologic response. In contrast, the high Cascades are made up of highly permeable young basalts, basaltic andesites, andesites, pumice, and ash less than 7 million years old, in an undissected landscape with gentle terrain. The lava flows in the high Cascades have very high permeability rates due to rock lithology (permeable basalt); blocky lava flow structure; and layering within lava flows and multiple flows. The end result is a “hydrologic sponge” that stores a huge amount of water due to very high intrinsic porosity. In this area of broad shield volcanoes, extensive aquifers are formed and they are constrained by lava flow geometry (not always by topography). Groundwater is discharged at large volume, cold springs (e.g., Tamolitch Pool, McKenzie River).

Further study by Ph.D. student Anne Jefferson and Dr. Grant revealed more details regarding how this high Cascade hydrologic system functions (see Dr. Jefferson’s dissertation at: http://andrewsforest.oregonstate.edu/pubs/pdf/pub4749.pdf). They found using radioactivity measurements that the transit time of the water to springs ranges from 3-14 years (flow weighted avg = 7.2 yr), with generally shallow flowpaths. The young basalt area of the Oregon Cascades covers 2660 km^2. Assuming an average precipitation input of 1500 mm/yr (59 in/yr) and a residence time of 7.2 yr, a total active storage of 29 km^3 (23,510,680 ac-ft) can be calculated, which is roughly similar to Lake Mead’s 35 km^3. This huge amount of stored water has large hydrologic implications. A groundwater velocity in this rock type of 0.1 to 0.6 m/day allows 82% of the August flows in the McKenzie River to be produced from 12-15 springs. Tributaries to the Willamette River are hybrids (i.e., producing varying amounts of summer discharge), with the McKenzie, North Santiam, Clackamas and Middle Fork Willamette providing a disproportionate amount of flow in the summer. The Pit River in northern California is the closest analogy to the McKenzie River (with high summer discharge) in this state.

Western Cascade rivers without spring-fed systems can be characterized as having mobile large wood, coarse floodplains and boulder bars, large rain-on-snow floods, flows that vary seasonally, and step-pool channel types. In contrast, high Cascade rivers have stable wood accumulations, lack developed floodplains, rarely have large floods, have sustained flow year-round, and generally have disorganized bed structures. Turbidity, suspended sediment concentrations, and water temperatures are lower in spring-fed high Cascade rivers, when compared to flashy western Cascade rivers. The result is that bull trout, a listed species, has a distribution that conforms to high Cascade geology.

Dr. Grant next discussed the implication of climate change on these two types of hydrologic systems. Snowpacks have gotten smaller, are melting earlier, and are projected to continue to diminish through the rest of this century. He asked the question: how will the interplay of snowpack dynamics and landscape drainage efficiency affect streamflow regimes under climate warming scenarios? In order to understand the relative impact of geology and snow accumulation/melt regimes, the RHESSys (Regional Hydrologic Ecosystem Simulation System) model was used (the model is described at: http://fiesta.bren.ucsb.edu/~rhessys/about/about.html). The fast draining landscape system (western Cascades) was compared to the spring-fed system (high Cascades) with different future climate projections (e.g., 1.5 ^oC climate warming). The modeling reveals decreased summer flows for the high Cascades spring-fed system and an earlier summer drought for the western Cascades flashy rivers (see Tague and Grant 2009, http://naldc.nal.usda.gov/download/35542/PDF). This work illustrates the importance of geological factors in interpreting hydrologic response to climate change.

In contrast to the young volcanic rocks in the high Cascades, much of the Sierra Nevada has old granitic rocks, is surface flow dominated, and has water stored in snowpacks and reservoirs (not groundwater). The Battle Creek watershed in Tehama County has a mixture of young and old volcanic rocks and can be characterized as a hybrid system. The North Fork of Battle Creek has younger rocks and is more spring-influenced, while the South Fork has older volcanics and more flashy flows. Additionally, there are an abundance of dams and diversions, greatly affecting peak flows and low flows in this basin.

The implication of timber harvest conducted within young volcanic terranes with deep groundwater systems was then discussed. While there are no paired watershed studies for hard data, Dr. Grant stated that the effect of harvest on peak flows should be less than that in shallow subsurface flow systems, due to: (1) lower drainage density, (2) longer response times, and (3) more bypass recharge (see Grant et al. 2008 at: http://www.fs.fed.us/pnw/pubs/pnw_gtr760.pdf). Harvest effects on low flows were also briefly discussed. Dr. Grant emphasized that changes in low flows are likely a bigger issue than changes in peak flows with climate change. Turbidity values for the Battle Creek watershed from MacDonald and James (2012) were described as very low and were characterized as being consistent with a mixed age volcanic landscape. The impacts of the Ponderosa Fire on the Battle Creek watershed were not directly addressed, but Dr. Grant stated that research conducted on the 2003 B&B Complex Fires in the high elevation Oregon Cascades did not reveal changes in water yield following burning. Usually wildfires produce more water in shallow flashy systems, but the change is relatively short-lived.

Brief Update on Section V Technical Advisory Committee (VTAC) Activities

Pete Cafferata provided a brief PowerPoint update on Anadromous Salmonid Protection (ASP) Rule Section V Technical Advisory Committee (VTAC) activities. The PowerPoint is posted at: http://www.bof.fire.ca.gov/board_committees/monitoring_study_group/msg_archived_documents/. Background information on Section V was provided, as well as a description of the five main types of potential riparian proposals that can be submitted for review (i.e., placement of large wood, thinning conifers for increased growth, thinning for fuel hazard reduction, modifying riparian stand composition, and sediment reduction). **The draft VTAC guidance document is nearly complete and will undergo RPF peer review in the near future; it will be completed before the end of the year. Training for RPFs and agency personnel is anticipated to occur next year.** One pilot project is under development with Green Diamond Resource Company in Humboldt County and additional potential projects are being considered with other landowners. **The next VTAC conference call is scheduled for October 12th (10:00 a.m. to noon).**

Public Comment/New and Unfinished Business

George Gentry announced that the MSG and the BOF will actively work to establish its Effectiveness Monitoring Committee in January 2013. This effort will be used to determine if recently adopted FPRs rules are effective in protecting beneficial uses such as salmonid habitat, or if further modification is required. The goal is to build a water quality-related effectiveness monitoring program that can provide an active feedback loop to policymakers, managers, agencies, and the public. We plan to use scientific findings consistently by applying an approach similar in concept to that utilized by the Adaptive Management Program in the state of Washington. It is anticipated that twelve members will be appointed by the BOF for this committee. Draft documents written in 2009 describing the process envisioned are posted on the MSG archived website: http://www.bof.fire.ca.gov/board_committees/monitoring_study_group/msg_archived_documents/.

Next Monitoring Study Group Meeting Date

The next MSG meeting date was tentatively planned for December 12, 2012, with the meeting likely to be either in Williams or Willows. When a definite date, venue, and agenda are available, this information will be emailed to the MSG contact list.